Fire Barrier Degradation Ratings

Table 5.1 Quantification of Degradation Ratings (DR) of the Individual DID Elements[6]						
Level of Degradation	***3-Hour Fire Barrier***	***1- Hour Fire Barrier***	***20-feet Separation***	***Automatic Fire Suppression Effectiveness***	***Manual Fire Fighting Effectiveness (Fire Brigade)***	
					Outside Control Room	Inside Control Room
High	0	0	0	0	-0.25	-0.75
Moderate	-1.25	-0.5	N/A	-0.75	-0.5	-1
Normal Operating State	-2 (door(s), or multiple dampers, or damper & door)) -2.5 (damper or multiple penseals or both) -3	-1	-2	-1.25	-1	-1.5

Fire Barrier Guidance [Excerpted From 0609, Appendix F]

The normal operating state category reflects full compliance with existing regulations and regulatory guidance. Specified by the existing regulations and regulatory guidance is the need for fire protection systems and features to meet fire protection industry codes and standards. A fire protection system or feature is considered to be in a normal operating state when its design conform with the minimum design, installation, and performance criteria specified by the code-of-record.

3-Hour Barrier:

> The bases for the failure probabilities in Table 5.1 follow. The normal operating state probability for the 3 hour barrier is found in several NRC and industry documents (e.g. EPRI Fire PRA Implementation Guide p.4-43, NUREG/CR-4832 p.3-84, and other documents e.g. NUREG/CR-4550).

1-Hour Barrier:

> The 1 hour barrier provides less protection than the 3 hour barrier, and the credit is assigned appropriately.

20-Foot Separation:

> Credit given for the normal operating state 20-foot separation relies on NUREG/CR-3192, and is substantial.

Passive Fire Protection Features [From 0609, Appendix F, Attachment 2]

The following evaluation guidance is to be used for making qualitative judgements relating to the general effectiveness of passive fire protection features used to protect post-fire safe shutdown capability or prevent a fire from spreading from one fire area, zone or room to another:

- The inspector should determine that the fire wall, ceiling, floor or raceway/equipment fire barrier of concern provides passive fire resistive separation for redundant trains of systems, components, or equipment required for plant shutdown. The barrier should be intact.

- The in-situ fire load could be in a configuration that represents a challenge to the passive fire barrier or fire resistive device under consideration.

  The guidance table for penetration seal degradations assumes that the silicone material is mixed and its cell structure is in accordance with the manufacturers recommendations and guidelines.

- For inspection findings (degradations) related to silicone foam penetration seals15 see the table at the end of this section.

The following are examples of observed conditions that may represent a high impact (degradation) on the ability of the fire barrier or passive device to perform its intended function:

- Completely removed or missing fire barrier protecting or separating redundant safe shutdown systems or components.

- Breach in a electrical raceway fire barrier system which is contained with in a fuel package (barrier system is in a cable tray stack)

- Fire barrier system design which is mis-applied or with a indeterminate16 fire resistive rating.

- Ceiling fire barrier system with unsealed openings.

- Un-analyze unprotected openings in a fire area/barrier wall and these openings fall within the upper half of the wall.

  In order to be able to assess the fire resistive worth of a indeterminate fire barrier assembly and its ability to provide protection under the fire conditions anticipated , the licensee must demonstrate by analysis of fire endurance test data for similar barrier designs that the design under consideration will perform as good as a design that has been qualified by subjecting it to a standard-time-temperature test fire exposure.

- In operable fire door or damper in a fire area/ barrier wall.

- Blocked open fire door.

The following are examples of observed conditions that may represent a moderate impact (degradation) on the ability of the fire barrier or passive device to perform its intended function:

- Fire dampers assemblies installed in a fire barrier which is not qualified to close under the anticipated ventilation system air flow.

- Fire dampers installed in fire barrier assemblies which are not installed with the required thermal expansion clearances as determined by the conditions of its qualification testing.

- Temperature set-point of the fusible link is excessively high or the fusible link has been improperly installed. These links are generally used to activate fire door / damper closure.

- Bent or warped fire door.

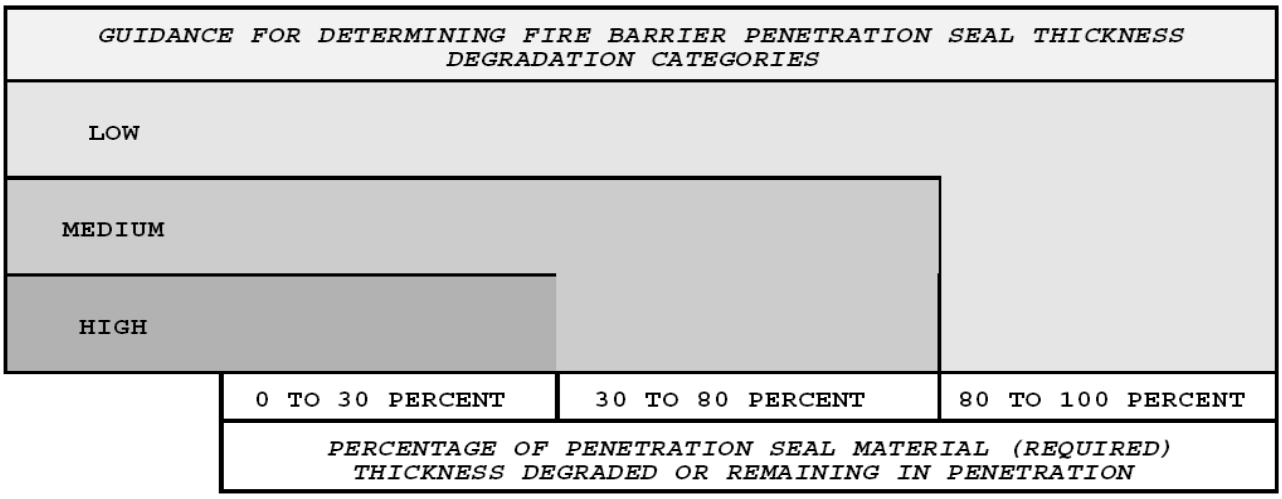
- Fire door with a single side through hole.

- Excessive fire door to frame and door to floor clearance gaps.

- Improperly installed or qualified fire door hardware.

- Raceway or equipment fire barrier assembly which has been mechanically damaged and the fire barrier wall thickness has been reduced by 25 percent over a total of 6 square inches.

- Penetration seal assembly which are not qualified by test or analysis (e.g., thermal penetration mass is greater than that tested) to withstand the fire conditions anticipated in the room, zone or area under consideration.

The following are examples of observed conditions that represent a normal operating state:

- Fire door installed and maintained in accordance with the code-of-record.
- Fire damper installed and maintained in accordance with the code-of record.
- Fire barrier penetration seal installed in accordance with the construction attributes and conditions qualified by fire tests.
- Raceway and equipment fire barrier assemblies installed in accordance with the construction attributes and conditions qualified by fire tests.
- Fire walls/barrier assemblies installed in accordance with the construction attributes and conditions qualified by fire tests.